

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of :

Fukushige et al :

Group Art Unit: 1752

Application No. 09/894,827 :

Examiner: John S. Chu

Filed: June 29, 2001

For: PHOTOPOLYMERIZABLE COMPOSITION AND
RECORDING MATERIAL AND RECORDING PROCESS USING
THE SAME

DECLARATION UNDER 37 C.F.R. §1.132

Commissioner of Patents and Trademarks

Alexandria, VA 22313-1450

Sir:

I, Yuuichi Fukushige, do declare and state as follows:

I graduated from the graduate school of Kyushu University,
Division of Organic Synthesis with a Master's Degree in chemistry
in March 1987;

I joined Fuji Photo Film Co., Ltd. in April 1987 and have
been working there since;

I was involved in the analysis of organic synthesis for
heat-pressure sensitive materials from April 1987 to March 1992;

From 1992 to 1999, I was involved in research and
development for application and commercialization of functional

materials;

From 1999 to 2004, I was involved in technical development with respect to a range of development stages from element research to ink jet commercialization;

From 2004, I have been involved in the development of flat panel display materials;

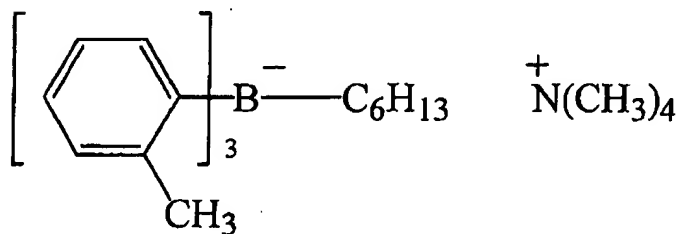
I am a co-inventor of the subject matter disclosed and claimed in the above-identified application; and

I am familiar with the Office Action of May 26, 2006, and understand that the Examiner has rejected Claims 22 to 46 as being unpatentable over the combination of prior art references.

Experiment A:

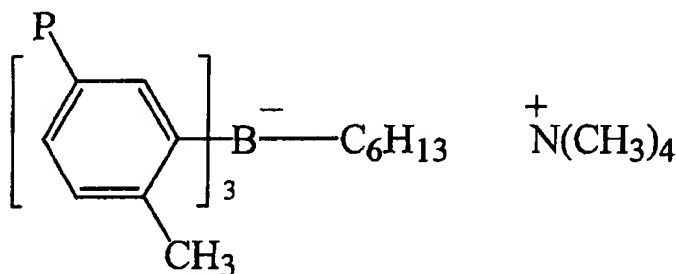
1. Preparation of photopolymerizable compositions

A photopolymerizable composition (A) in which the dye was the dye compound of Example 9 of reference Cunningham and the borate compound was borate compound m of reference Cunningham (see the following borate compound m) was obtained according to the method of Example 34 of reference Cunningham.



Borate compound m of Example 34 of Cunningham

Further a photopolymerizable composition (B) in which the dye was the dye compound of Example 9 of reference Cunningham and the borate compound was borate compound r of reference Cunningham (see the following borate compound r) was obtained according to the method of Example 35 of reference Cunningham.



Borate compound r of Example 35 of Cunningham

The obtained photopolymerizable compositions were made into emulsions, these were made into recording sheets according to the same method as in the Examples of the present application, and evaluation was carried out. The specific processes are described below.

2. Preparation of an emulsion of a photopolymerizable composition

The photopolymerizable composition obtained above, of reference Cunningham, was added to a mixture of 13 g of an 8% aqueous solution of gelatin and 0.8 g of a 10% aqueous solution of the following surfactant (1). The resulting mixture was emulsified at a revolution of 10000 rpm for 5 minutes by means of a

HOMOGENIZER (manufactured by NIPPON SEIKI Co., Ltd.), and an emulsion of a photopolymerizable composition was obtained.



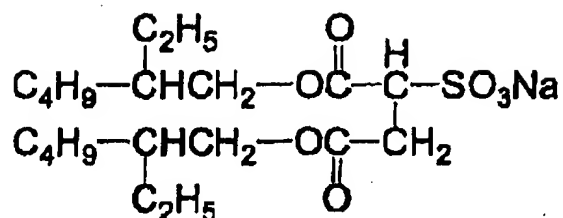
Surfactant (1)

3. Preparation of a coating liquid for photo- and heat-sensitive recording layer

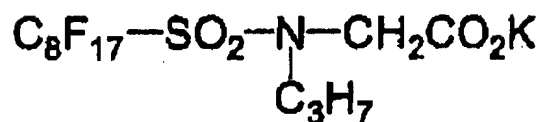
A coating liquid for photo- and heat-sensitive recording layer was prepared by mixing 2 g of the microcapsule liquid (II) described in the Examples of the present application and containing microcapsules enclosing an electron-donating colorless dye, 8 g of the emulsion of a photopolymerizable composition, and 1.5 g of a 4% aqueous solution of gelatin.

4. Preparation of coating liquid for protective layer

A coating liquid for protective layer was prepared by mixing 8.8 g of an 18% aqueous solution of gelatin, 7.0 g of distilled water, 0.4 g of a 2% aqueous solution of the following surfactant (2), 1.2 g of a 2% aqueous solution of the following surfactant (3), 8.8 g of a 2% aqueous solution of a vinylsulfone-based compound (hardener), and 1.8 g of 20% JULYMER AC10LA (polyacrylic acid, manufactured by Nippon Pure Chemicals Co., Ltd.).



Surfactant (2)



Surfactant (3)

5. Preparation of photo- and heat-sensitive recording material

The coating liquid for photo- and heat-sensitive recording layer was applied using a coating bar onto a 198 μm -thick WP (resin coat sheet) support such that the dry mass of the entire coating layer was 3.0 g/m^2 , and the coating layer was dried. The layer was overcoated with the coating liquid for protective layer using a coating bar such that the dry mass of this coating layer was 2 g/m^2 , and the coating layer was dried, to obtain a photo- and heat-sensitive recording material.

6. Printing of the photo- and heat-sensitive recording material

The photo- and heat-sensitive recording material was

exposed by use of a semiconductor-excited, YLF solid-state laser having a wavelength of 532 nm from the protective layer side, wherein the maximum irradiation energy was 1.2 mJ/cm^2 and the irradiation energy was varied stepwise so that a step-wedge image was formed. The recording material having a latent image due to the exposure described above was heated for 10 seconds by means of a hot plate at 110°C . After that, the entire surface of the recording layer of the recording material was irradiated with light for 30 seconds on a 38000 lux fluorescent lamp irradiator. The irradiation produced sharp coloration, and a step-wedge image having high-level whiteness in the background was obtained.

7. Assessment of sensitivity

For sensitivity, the energy required until the background of the material was formed (i.e., "the energy until the background was formed") was calculated, and this value was used as an indicator of sensitivity. Accordingly, the smaller the value, the higher the sensitivity is. The results of the measurements are shown in the following Table 1.

8. Measurement of density

Thermal treatment

The photo- and heat-sensitive recording material that was obtained according to the processing described above was left under an environment of 50°C and 80% relative humidity for one day.

Measurement of density

The coloration density (D_{\max}), the fogging (D_{\min}) of the background, and the fogging ($D_{\min-S}$) of the background after the thermal treatment were measured using a Macbeth transmission densitometer or a Macbeth reflection densitometer (manufactured by Macbeth Corp.).

9. Preparation of Other photo- and heat-sensitive recording material (C) and (D)

In addition, heat-sensitive recording materials (C) and (D) were also prepared in which the proportion of the dye with respect to the borate compound in Examples 34 and 35 of reference Cunningham was changed from 0.3% to 0.001%.

10. Results

The assessment results are shown below.

According to the attached assessment results, it is understood that the scope of the claims of the present invention (a ratio of the organoboron compound to the organic dye of at least 4) provides remarkable effects of high density and low fog.

Table 1

| Examples of the present specification | Borate/dye (molar ratio) | Sensitivity (mJ/cm ²) | Dmax | Dmin | Dmin-S (after thermal treatment) |
|---------------------------------------|--------------------------|-----------------------------------|------|----------|----------------------------------|
| Example 1 | 4 | 10.4 | 2.3 | 0.11 (M) | 0.13 |
| Example 8 | 4 | 0.5 | 1.7 | 0.1 (Y) | 0.11 |
| Comparative Example 1 | 0.5 | 100 | 2.3 | 0.55 (M) | 0.58 |
| Comparative Example 2 | 0.5 | 50 | 2.2 | 0.6 (C) | 0.65 |
| Cunninhham | Borate/dye (molar ratio) | Sensitivity (mJ/cm ²) | Dmax | Dmin | Dmin-S (after thermal treatment) |
| Composition (A) Dye:9/Borate:m | 1.83 | 250 | 2.1 | 0.95 (M) | 0.62 |
| Composition (B) Dye:9/Borate:r | 1.62 | 300 | 1.9 | 0.81 (M) | 0.76 |
| Composition (C) Dye:9/Borate:m | 303 (= 0.4%/0.001%) | 0.3 | 2.2 | 0.11 (M) | 0.12 |
| Composition (D) Dye:9/Borate:r | 332 (= 0.4%/0.001%) | 0.4 | 2 | 0.10 (M) | 0.13 |

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

DATE: Oct. 26, 2006

Yuuichi Fukushige
Yuuichi Fukushige